DEVIATION MEASUREMENTS with the RS-UV3

The MFJ 224 FM analyzer uses the Motorola MC13135 communications receiver IC. Pin 17 provides recovered audio. The spec sheet for the MC13135 provides Recovered audio verses Deviation in graphical form in figure 10 on page 5. Using this graph the following table was generated.

Deviation	R 39	R 47	R 68	
1	175	205	310	
3	449	580	845	V
5	695	870	1230	P-P
7	910	1120	1560	
1	62	72	110	
3	159	205	299	V
5	246	308	435	RMS
7	322	396	551	

Where R is the value of the resistor in the Quad Coil input circuit at pin 13 of the MC13135
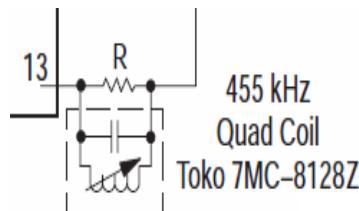
From the spec sheet it appears that R is dependant on the received frequency range.

Thus we see that the un-emphasized audio voltage can be used to measure deviation.

A Yaesu FT1802 was used to do the following tests. This unit provides a Calibration (Service) Menu that can be used for adjusting various function of the rig including deviation. Checking this function revealed that the adjustable range is from 01 to FF hex, or 1 to 255 decimal. The rig specifications indicate that the deviations can be set to 5 KHz (wide) or 2.5 KHz (narrow).

At 5 KHz the service menu indicates a setting of 86 hex, or 134 decimal. Using this information the attached spread sheet was created. The sheet shows the estimated deviation for all setting values from 1 to 255.

With this information in hand the attached drawing shows the set up that was used for testing.

De-Emphasis was turned off via a VB6 program for sending operation codes to the UV3. Pin 4 on the RS232 jack on the UV3 was used to feed de-emphasized audio to an oscilloscope.

A 1.5 KHz sin wave tone is feed to an interface box that allows feeding this audio tone to the rig.

Using the service menu for the FT 1802 various deviation settings we set, the interface box is turned on and transmits the audio tone. Voltage readings were taken from the oscilloscope.

The table at the bottom of the attached drawing shows the results of theses tests.

Although this may not be accurate enough for service purposes it can be used to monitor a repeater to see if there is any change in deviation, indicating a problem with the repeater.

It should be noted that the MFJ 224 dose have the capability to measure deviation but the unit drifts to much to be able to obtain a useful reading.

Deviation Measurements with RS-UV3 3 Band Circuit Board

Diamond Dual Band

Rubber Duckie

9 V DC
Wall
Wart

Frequency 146.475
Low power

Yaesu FT 1802
2 M FM

RS UV3 Board

Mic

Pin 4
RS232
jack

Interface Box

Interface
cable

1.5 KHz
1.005 Vrms
+02.3 dBm

Audio
Signal
Gen

USB

Set De-Emphasis Off
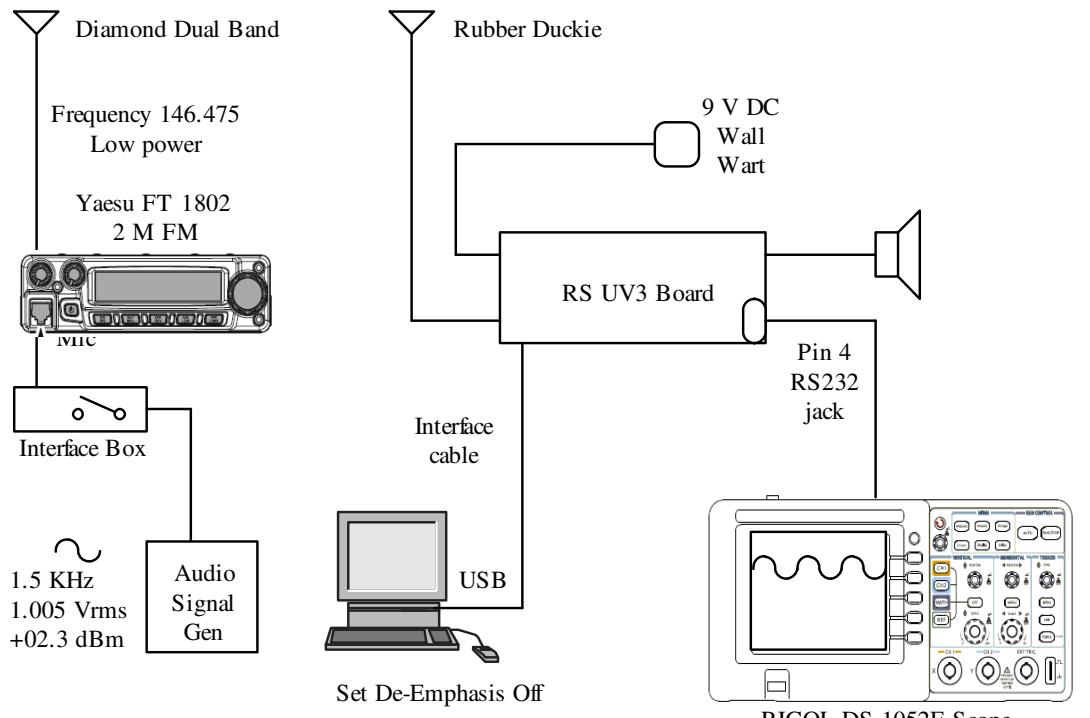
*Use Service Menu
to adjust various
levels of Deviation*

RIGOL DS 1052E Scope
CH 1 - 50 mV / Div
200 uS

Vmax=72.0mV	Vavg=-2.76mV	Rise=200.0us
Vmin=-66.0mV	Vrms=44.4mV	Fall=172.0us
Vpp= 138mV	Vovr=5.0%	+Wid=336.0us
Vtop=64.4mV	Vpre=1.8%	-Wid=336.0us
Vbas=-59.8mV	Prd=672.0us	+Duty=50.0%
Vamp= 124mV	Freq=1.488kHz	-Duty=50.0%

Scope Measurements Table

Deviation Tests - UV-3					
1802 Deviation		Scope Voltages		Deviation	
Hex	Dec	Rms	P-P	(Calculated)	Comment
40	64	21.5	70.0	3	
60	96	32.1	100.0	4	
86	134	44.2	136.0	5	as found *
9F	159	49.5	150.0	6	
BF	191	54.2	166.0	7	
*	NOT Calculated				

DevTestSetUp.cdd - 12-30-15

Deviation Settings for Yaesu FT 1802

DEV - Deviation in KHz

Hex	Dec	Dev	Hex	Dec	Dev	Hex	Dec	Dev	Hex	Dec	Dev	Hex	Dec	Dev	Hex	Dec	Dev	Hex	Dec	Dev	Hex	Dec	Dev
1	1	1.03	21	33	2.03	41	65	3.03	60	96	4.03	80	128	5.03	A0	160	6.03	C0	192	7.03	E0	224	8.03
2	2	1.06	22	34	2.06	42	66	3.06	61	97	4.06	81	129	5.06	A1	161	6.06	C1	193	7.06	E1	225	8.06
3	3	1.09	23	35	2.09	43	67	3.09	62	98	4.09	82	130	5.09	A2	162	6.09	C2	194	7.09	E2	226	8.09
4	4	1.13	24	36	2.13	44	68	3.13	63	99	4.13	83	131	5.13	A3	163	6.13	C3	195	7.13	E3	227	8.13
5	5	1.16	25	37	2.16	45	69	3.16	64	100	4.16	84	132	5.16	A4	164	6.16	C4	196	7.16	E4	228	8.16
6	6	1.19	26	38	2.19	46	70	3.19	65	101	4.19	85	133	5.19	A5	165	6.19	C5	197	7.19	E5	229	8.19
7	7	1.22	27	39	2.22	47	71	3.22	66	102	4.22	86	134	5.22	A6	166	6.22	C6	198	7.22	E6	230	8.22
8	8	1.25	28	40	2.25	48	72	3.25	67	103	4.25	87	135	5.25	A7	167	6.25	C7	199	7.25	E7	231	8.25
9	9	1.28	29	41	2.28	49	73	3.28	68	104	4.28	88	136	5.28	A8	168	6.28	C8	200	7.28	E8	232	8.28
A	10	1.31	2A	42	2.31	4A	74	3.31	69	105	4.31	89	137	5.31	A9	169	6.31	C9	201	7.31	E9	233	8.31
B	11	1.34	2B	43	2.34	4B	75	3.34	6A	106	4.34	8A	138	5.34	AA	170	6.34	CA	202	7.34	EA	234	8.34
C	12	1.38	2C	44	2.38	4C	76	3.38	6B	107	4.38	8B	139	5.38	AB	171	6.38	CB	203	7.38	EB	235	8.38
D	13	1.41	2D	45	2.41	4D	77	3.41	6C	108	4.41	8C	140	5.41	AC	172	6.41	CC	204	7.41	EC	236	8.41
E	14	1.44	2E	46	2.44	4E	78	3.44	6D	109	4.44	8D	141	5.44	AD	173	6.44	CD	205	7.44	ED	237	8.44
F	15	1.47	2F	47	2.47	4F	79	3.47	6E	110	4.47	8E	142	5.47	AE	174	6.47	CE	206	7.47	EE	238	8.47
10	16	1.5	30	48	2.5	50	80	3.5	6F	111	4.5	8F	143	5.5	AF	175	6.5	CF	207	7.5	EF	239	8.5
11	17	1.53	31	49	2.53	51	81	3.53	70	112	4.53	90	144	5.53	B0	176	6.53	D0	208	7.53	F0	240	8.53
12	18	1.56	32	50	2.56	52	82	3.56	71	113	4.56	91	145	5.56	B1	177	6.56	D1	209	7.56	F1	241	8.56
13	19	1.59	33	51	2.59	53	83	3.59	72	114	4.59	92	146	5.59	B2	178	6.59	D2	210	7.59	F2	242	8.59
14	20	1.63	34	52	2.63	54	84	3.63	73	115	4.63	93	147	5.63	B3	179	6.63	D3	211	7.63	F3	243	8.63
15	21	1.66	35	53	2.66	55	85	3.66	74	116	4.66	94	148	5.66	B4	180	6.66	D4	212	7.66	F4	244	8.66
16	22	1.69	36	54	2.69	56	86	3.69	75	117	4.69	95	149	5.69	B5	181	6.69	D5	213	7.69	F5	245	8.69
17	23	1.72	37	55	2.72	57	87	3.72	76	118	4.72	96	150	5.72	B6	182	6.72	D6	214	7.72	F6	246	8.72
18	24	1.75	38	56	2.75	58	88	3.75	77	119	4.75	97	151	5.75	B7	183	6.75	D7	215	7.75	F7	247	8.75
19	25	1.78	39	57	2.78	59	89	3.78	78	120	4.78	98	152	5.78	B8	184	6.78	D8	216	7.78	F8	248	8.78
1A	26	1.81	3A	58	2.81	5A	90	3.81	79	121	4.81	99	153	5.81	B9	185	6.81	D9	217	7.81	F9	249	8.81
1B	27	1.84	3B	59	2.84	5B	91	3.84	7A	122	4.84	9A	154	5.84	BA	186	6.84	DA	218	7.84	FA	250	8.84
1C	28	1.88	3C	60	2.88	5C	92	3.88	7B	123	4.88	9B	155	5.88	BB	187	6.88	DB	219	7.88	FB	251	8.88
1D	29	1.91	3D	61	2.91	5D	93	3.91	7C	124	4.91	9C	156	5.91	BC	188	6.91	DC	220	7.91	FC	252	8.91
1E	30	1.94	3E	62	2.94	5E	94	3.94	7D	125	4.94	9D	157	5.94	BD	189	6.94	DD	221	7.94	FD	253	8.94
1F	31	1.97	3F	63	2.97	5F	95	3.97	7E	126	4.97	9E	158	5.97	BE	190	6.97	DE	222	7.97	FE	254	8.97
20	32	2	40	64	3	60	96	4	7F	127	5	9F	159	6	BF	191	7	DF	223	8	FF	255	9

128 (80h) = Center (50%)

FT 1802 DEV

Hex	Dec	Dev	Hex	Dec	Dev	Hex	Dec	Dev
41	65	3.03	60	96	4.03	80	128	5.03
42	66	3.06	61	97	4.06	81	129	5.06
43	67	3.09	62	98	4.09	82	130	5.09
44	68	3.13	63	99	4.13	83	131	5.13
45	69	3.16	64	100	4.16	84	132	5.16
46	70	3.19	65	101	4.19	85	133	5.19
47	71	3.22	66	102	4.22	86	134	5.22
48	72	3.25	67	103	4.25	87	135	5.25
49	73	3.28	68	104	4.28	88	136	5.28

New Products

HobbyPCB RS-UV3 VHF/UHF Radio Module

The HobbyPCB RS-UV3 radio module is a 144/222/450 MHz FM transceiver board. The RS-UV3 supports multiple interfaces including microphone/speaker, line level audio (sound card), TTL serial control and Arduino shield connections. The RS-UV3 has a built-in battery charger and provides conditioned power for the Arduino controller. The RS-UV3 covers 144 – 148, 220 – 225, and 420 – 450 MHz with 200 mW RF output and receiver sensitivity of –120 dBm for 12 dB SINAD. Spurious emissions are –60 dBc or lower. Power requirements are 9.5 – 15 V dc at 100 mA on receive and 250 mA on transmit. The RS-UV3 is compatible with Arduino and Raspberry Pi boards as well as *Windows*, *Linux*, and *Mac OS*. It includes on board support for beacon, repeater, single channel voice, Echolink, APRS and packet radio applications. Price: $89.99. A speaker-mic ($15), dc power supply ($10), and triband flexible antenna ($15) are available. For more information, visit **www.hobbypcb. com**.